all parts of the world; that very fair libraries are accessible at Singapore and Batavia; and that, at the latter place, scientific papers can be published in French, German, or Dutch, in the *Natuurkundig Tijdschrift*, while the *Journal of Eastern Asia*, of Singapore, publishes similar works in English.

"In the hope that you may be one of those who will make use of my 'Tampat Senang,' I remain, with all respect and friendship, "N. N. MIKLUHO-MACLAY
"28th April, 1875, Istana Johore,
"Residence of H.H. the Maharajah of Johore."

"In life, as in everything else, it is important to distinguish main points from secondary matter, and to act accordingly. Main points always remain main points, however important secondary objects may sometimes be. On account of this evidently correct view, I continue my journey into the interior of the Malayian peninsula, as my health is improving; to-morrow I shall go to Pahang, and for the moment I give up building the 'Tampat Senang.' It is possible that I must try and find some other locality than Johore for this, because the Maharajah of Johore, after nearly two months' talking, in which time I had made out all the plans and had completely gone through all the details of the proposed building, has at last declared to me that he only could let me have that tract of land which I had chosen for the 'Tampat Senang' for a certain number of years, and that he must retain certain rights on the same. As all this does not agree with my plans, and as the locality is not of decisive importance, I shall, in case the Maharajah does not decide differently, construct my 'Tampat Senang' somewhere else.

"I consider the foundation of Zoological Stations in the tropics (however simply and poorly they may be fitted out, if they are otherwise quiet and comfortable places for work) as of the greatest importance for zoology and botany, since museum collections and preparations in spirits cannot afford sufficient material for investigation either with regard to quantity or quality.

"I have sent a proposal to the Society of Naturalists at Batavia, to found a 'Tampat Senang'[1] for naturalists in the Moluccas (at Amboina or at Ternate), and I intend to send similar proposals to scientific societies at Calcutta, and in Australia, and to some friends in Chile. If Russian Societies of Naturalists assist me I intend eventually to found a Zoological Station at the Sea of Ochotsk, or on the Pacific Ocean, myself.

"Zoological Stations in the Moluccas, in the Himalayan Mountains, in Tasmania, in the Fiji Islands, in Magellan's Straits, in Kamtschatka, &c., will yield not a few important results for all natural sciences. These stations will be particularly important for those naturalists who travel not only as tourists or as trade travellers of science, as it were, but who are engaged on some special work which requires large and fresh materials. Upon my return (which, however, is very uncertain at present) I will communicate to you my plans on the 'Tampat Senang' (the name seems to me to be quite appropriate) in detail. As it seems to me, they must be somewhat different from such Zoological Stations as your own at Naples, or we shall have to wait too long for their foundation. On my part I shall do all in my power for the carrying out of this idea, which nevertheless must remain a secondary (although important) object for *myself*.

"The day before yesterday I read in NATURE of May 6 of the official inauguration of your station at Naples, with much pleasure, and amongst the names I found those of several friends and acquaintances; so that I am led to hope that the scientific world will be interested in the 'Tampat Senang' in other parts of the globe.

"My kindest regards to yourself and all workers at the Zoological Station of Naples.
"N. N. MIKLUHO-MACLAY
"Istana, Johore, 9th May (June?) 1875"

THE VATNA JÖKULL, ICELAND

THE following letter from Mr. W. L. Watts in reference to his journey across the Vatna Jökull has been forwarded to us by Mr. Logan Lobley. As we noted last week, this is the first time the Vatna Jökull has been crossed. The letter is dated "Grierestadir, by Jökull sá á fjöllum (Iceland), July 12, 1875."

"I am happy to say I have crossed the Vatna Jökull. It occupied between fifteen and sixteen days in bad weather. Euriffa is by no means the highest mountain in Iceland; my aneroids registered 1,250 feet above Euriffa's height, subject to their correction upon my return to England.

"I feel certain that the Jökulls of Iceland are advancing at a considerable speed. The part of the Vatua Jökull, in the south of Iceland, called Breithamerker Jökull, has advanced about one mile and a half since the 10th of May last, and threatens to cut off all communication in that direction along the shore. I think, however, its rapid advance is not, as the natives believe, owing to volcanic heat in the Vatna Jökull, but that it is caused simply by the vast increase of frozen material upon its cloud and storm-wrapped heights. This accumulation above the height of 5,000 feet goes on both in summer and winter, and below for another thousand feet the waste during the summer months by no means equals the accumulation during the rest of the year. The glacier at the north point, at which descended, by Kistufell has advanced about twelve miles since the making of Olsen's map of 1844, diverting the course of the Jökull sá á fjöllum and causing it to rise about twelve miles from where it appears to do upon the map, *i.e.* about eleven miles N.E. of Kistufell and twelve NN.W. of Kverker Jökull, instead of at the base of Kistufell. The grand old water-course it has vacated forms an excellent road for several miles. I feel sure Iceland must slowly but surely in course of time succumb to the same fate as befell the Greenland colonies.

"I am now about to proceed to the active volcanoes upon the north of Vatna Jökull. They are situated in the part of the Odalters-braun called Dyngurfjöllum, and as I expect in the Kverker Jökull. I shall have no time to hunt for any more this year, but if time will allow I shall visit the source of the great lava stream of Skaptar Jökull, a mountain I saw from the Vatna Jökull, situated in its S.W. limb, which I think may repay inspection; and the lignite in the N.W. of Iceland.

"The destruction wrought by the eruptions of last winter is considerable. Several farms have been ruined by pumice and ash. Poor, dirty, interesting Iceland! both fire and water, the latter in all its forms, appear to conspire against it."

ON AN IMPROVED OPTICAL ARRANGEMENT FOR AZIMUTHAL CONDENSING APPARATUS FOR LIGHTHOUSES

ORDINARY optical apparatus adapted for a lighthouse which has to illuminate the whole horizon, as at rock or insular stations, is unsuitable for stations situate on the coast line, or in narrow sounds, where the light has in some azimuths to be seen at great distances, in others at smaller, and where towards the land no light is wanted at all. The problem in such cases is to allocate the rays in the different azimuths in proportion to the distances and breadths of sea in which the light requires to be seen in those directions by the sailor. Before 1855 no attempt was made to deal with this question, excepting the simple expedient of placing a spherical mirror on the landward side, where no light was wanted, and thus the rays intercepted by the mirror were reflected back again through the flame, so as to be ultimately acted on by the apparatus at the seaward side. But this device did not in any way fulfil the condition of allocating the rays proportionally to the varying distances at which the light had to be seen in the different azimuths, nor to the amplitude of the arcs. What was required was *a system by which the whole light from the lamp should be spread horizontally and with strict equality over any given arc in azimuth; and at a light of unequal range, which must be seen at different distances in different azimuths, the rays should be allocated to each of such arcs in the compound ratio of the number of degrees and the distances from which the light has to be seen in such arcs.*

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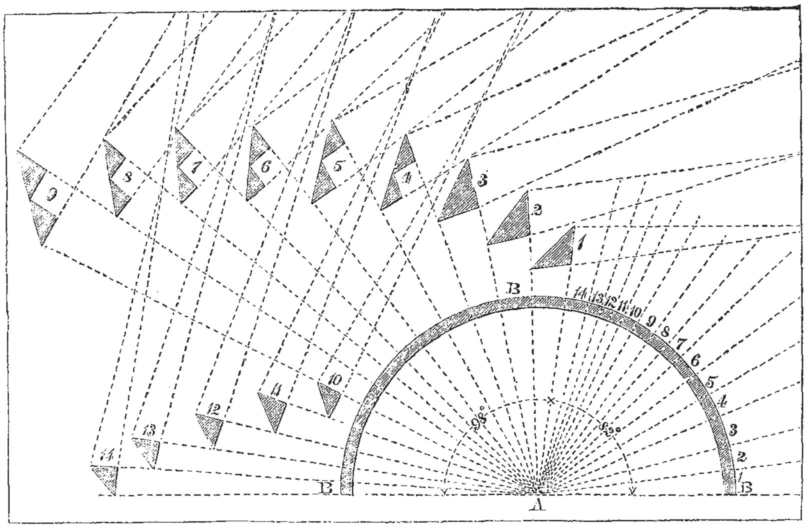
[1] It is a matter of course that what I expect from my future "Tampat Senang" cannot apply to others. Only mine shall remain true to its name, whether built at Johore, or at the Maclay coast in New Guinea.

It is unnecessary to give a description of the various methods of solving this problem for fixed and revolving lights, which I have elsewhere published under the name of "Azimuthal Condensing Lights."[1] All that is here required is to indicate generally the mode of dealing with fixed condensing lights, which was first employed for some narrow navigable channels on the west coast of Scotland in 1857, and which is now adopted in many different countries.

We shall take a case of the simplest kind in order to illustrate the principle :—

Let a lamp be surrounded by the fixed light apparatus of Fresnel, which allows the rays to pass through it unaltered in direction in azimuth, so as thus to show a light of equal intensity all round the horizon, but which operates on the rays in altitude by bending upwards, to the horizontal, those rays which would fall on the lightroom floor and be lost, and also by bending downwards to the horizontal those rays which would naturally pass up to the clouds. This instrument then strengthens the light passing to the sailor's eye, by bending upwards and downwards those rays which would otherwise be entirely lost. Suppose, however, that the light does not require to be seen at all in an arc in the direction of the land, and that there are two other sectors in azimuth in which the light has to be seen at greater distances than any others. If we place outside of Fresnel's apparatus in the azimuths towards the land (which may therefore be made dark) straight prisms which have each the property of spreading the light that falls on them over the sectors that require most strength, and if we proportion the number of these straight prisms to the required distances and to the number of degrees which have to be illuminated, we shall then fulfil this simplest case of the problem, viz., the due strengthening of the light in the directions of the longest ranges, and its uniform distribution in azimuth over those sectors.

The diagram represents in horizontal middle section the design for a new light which is about to be erected and which requires to illuminate different arcs with light of different intensity. A is the lamp encircled in front by B, which represents part of Fresnel's fixed light apparatus, outside of which are shown straight vertical prisms numbered 1 to 14 for condensing the rays over the arcs in azimuth that have to be strengthened, and which arcs have corresponding numbers 1 to 14. The novelty in this arrangement is the mode adopted for reducing the space which would otherwise be occupied by the condensing prisms but for which there is no room in a lantern of ordinary size.



My friend Prof. Swan, of St. Andrews, among other ingenious devices in a paper read to the Royal Scottish Society of Arts, proposed, in order to reduce the space occupied by the apparatus, to place prisms *behind* others and to project the rays from the prisms behind, forwards through spaces left between the prisms in front. In the present design I have availed myself of this proposal. The prisms 10 to 14 throw their light between the prisms 3 to 8. Owing, however, to the natural divergence due to the size of the flame, much useful light would be lost by impinging against the edges of the outer prisms unless those prisms were separated farther from each other in order to afford wider spaces for the cones of light to pass through. But this again would increase the space occupied by the apparatus. The difficulty may be overcome by cutting out the apex of the outer prisms as shown in prisms 4 to 9. This would, as in Buffon's annular lens, also materially reduce the absorption of the light which passes through them. For facility of construction, however, instead of one prism cut in this manner, two small separate prisms arranged symmetrically with the larger one have been substituted.[1] By means of these groups of *twin prisms* the apparatus is reduced within practicable dimensions, while the quantity of glass employed in the apparatus is materially lessened, and the loss from absorption is reduced by about one-tenth.

It is only necessary to add that while the cost of the first apparatus of the kind will be increased by the greater number of moulds required for casting the prisms, it will on the other hand be reduced by the smaller quantity of glass required. The amount of glass surface which has to be ground and polished is of course the same for each pair of twin prisms as for one single large prism.

The new apparatus will, in addition to what has been described, require at the back of the flame the Dioptric spherical mirror which I proposed in 1849[2] with the improvements suggested by Mr. J. T. Chance in 1862, and above the flame, prisms of the new forms suggested by Mr. Brebner and myself, and also independently by Prof. Swan, and which were first introduced at Lochindaal in Argyllshire, in 1869.[3] The apparatus will therefore embrace in all six different optical agents, and will compress into one sector of 82° light which would naturally diverge uselessly over 278°. This condensing apparatus is, however, not nearly so powerful as others now in use. In the two which I designed for Buddonness-on-the-Tay, one of which was exhibited at the Paris International Exhibition, the whole sphere of light was compressed into one sector of 45°, and in another design lately made for the Colonies the light is condensed into 30°.

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[1] Edin. New Phil. Journal, 1855, p. 273. "Lighthouse Illumination," Edinburgh, 1871; second edition, p. 79.

[1] If the prism be of large size, more than two prisms may of course be substituted.

[2] Trans. Roy. Scott. Soc. of Arts, 1850.

[3] "Lighthouse Illumination," p. 75.

THOMAS STEVENSON

THE BRITISH ASSOCIATION

BRISTOL, *Tuesday Evening*

BRISTOL bids fair fully to accomplish its intention of giving the Association one of the best receptions it has ever received. When the visitor has laboured through the inconveniences of the railway station, and got fairly at home in this region of hills and valleys, and cliffs and quays, and churches and chimney stacks, he will find himself as happily situated as anyone but a confirmed grumbler could wish.

The local committee have evidently spared no expense to increase the comfort of visitors. The engagement of the entire Victoria Rooms for reception rooms has given ample space for almost every requirement. The great hall itself contains many of the necessary offices, including those for the local officials, sale of tickets of all kinds, distribution of printed circulars, and a telegraph and post-office; in addition, Messrs. Bingham's book-stall supplies all kinds of journals and scientific publications. A first-rate refreshment room occupies one of the smaller halls, and a reasonable tariff of prices is published. Almost every want seems to have been anticipated, and the honorary local secretaries, Messrs. W. Lant Carpenter and J. F. Clarke, with many other zealous workers, have been labouring untiringly to have everything in order. So successful were they, that the reception rooms were opened exactly at the moment previously announced—one o'clock on Monday; and the first rush to secure tickets was most satisfactorily worked off. It will be surprising if the amount expended do not exceed the local subscription of 2,400*l*. At any rate, so far as experience goes at present, that full success is likely to be realised which is worth very much more than can be measured by money. The Mayor (Mr. Thomas) to-day took up his residence at the Mansion House, where he will receive the President-elect, Lady Hawkshaw, and other distinguished visitors. Most of the notable visitors come as invited guests.

The columns of NATURE would certainly fail me if I attempted to enumerate the objects of interest here which are thrown open freely to members of the Association. Churches, old buildings of all kinds, libraries, ships, quays, warehouses, parks, and mansions are alike at the disposal of the visitors.

Notable amongst hospitalities will be the banquet of the Merchant Venturers' Society, at which about a hundred of the leading members of the Association will be entertained on Tuesday evening next. The hall of the Merchant Venturers has lately been decorated with a magnificence worthy of their distinguished history. The sovereigns who granted them charters, the Bristol worthies, Edward Colston, Alderman Whitson, Sebastian Cabot, William Canynge, and Thomas Daniel are all commemorated by portraits or arms; while the staircase and vestibule bear significant emblems of seafaring life. Saturday next is the jubilee of the Bath Royal Literary and Scientific Institution. This will be celebrated by a public meeting and banquet, presided over by the Earl of Cork, lord-lieutenant of the county. Sir John Hawkshaw and many other distinguished guests are expected.

As a matter of course nearly all the eminent British men of science are expected to be present, and many of them have already arrived. Among foreign visitors who have arrived or are expected, there are Prof. Paul Gervais, of Paris; Chevalier Negri, President of the Geographical Society of Turin; Chevalier Bergeron, C.E., Paris; Prof. Geinitz, Dresden; Prof. Hébert, Paris; Dr. Leitner; Prof. Youmans, United States; Mr. H. A. Rowland, Baltimore; Prof. Janssen, Paris; M. Léon Vanderkinden, Brussels University; Dr. A. Oppenheim, Berlin; Colonel Carrington, Wabash College, U.S.

Of course the general meetings, inaugural address, lectures, and soirées will be given in the Colston's Hall, which can seat 3,000 persons. The sections are accommodated in a number of buildings extending along one line of thoroughfare, from the Wesleyan schoolroom in Victoria Place to the Royal Hotel at College Green. Sections A and G sit in the Fine Arts Academy; B in the Lecture Theatre, Freemasons' Hall; C in the New Museum Lecture Room; D in three departments at Hamilton's Rooms, Park Street, the Grammar School, and the Royal Hotel; E in the Blind Asylum Music Room; F in the schoolroom of Victoria Chapel. On the back of every Association Ticket a plain map of about one square mile of Clifton is printed, showing in red colours all the buildings used for meetings. This is a most valuable help for visitors.

A first-rate loan museum is exhibited in the new portion of the Museum buildings, and is well worthy of attention. Among the most interesting things to be seen are specimens from many local collieries of every vein of coal they work, local building-stones and clays; and capital illustrations of local zoology and botany. The Museum proper is noticeable for its splendid collection of Triassic reptiles, Labyrinthodonts, and Palæozoic fishes, especially *Thecodontosaurus* and *Ceratodus*. A splendid skeleton of *Ichthyosaurus platyodon* has just been mounted. It was detected by Mr. Tawney on the beach near Lyme Regis, close to low-water mark. It was brought up in large fragments of over a hundred-weight, in all over a ton, and developed under Mr. Tawney's superintendence. The skeleton is swung instead of being supported from beneath, according to an idea of Dr. H. Fripp, and it can be examined very closely, and on both sides, being placed on a stand of the ordinary height of table cases. It was an enormous individual. The present remains, although lacking the snout and much of the tail, extend to a length of about twenty-five feet.

The excursions for Thursday week are numerous and calculated to please all tastes; they are to (1) Bath, (2) Bowood and Avebury, (3) Cheddar, (4) Chepstow and Tintern, (5) Portishead, Cadbury Camp, and Clevedon, (6) Salisbury and Stonehenge, (7) Sources of Bristol Waterworks Supply, (8) Tortworth and Damery Bridge, (9) Wells and Cheddar, (10) Weston-super-Mare.

The arrangements for transit and entertainment are most complete. The soirées give promise of great success. The first is to be under the auspices of the Bristol and Bath Natural History Societies, and many specimens of living microscopic animals will be exhibited. At the second, the post office officials intend to make a very elaborate display of telegraphic instruments and processes.

It is worthy of remark that it was at the meeting of the Association at Bristol in 1836 that Section G (Mechanical) was instituted; and at that meeting Dr. Lardner expressed his opinion that the proposed scheme of crossing the Atlantic by steam was an impossibility. From Bristol, however, the first steam-ship traversed the Atlantic to New York.

It was in the Bristol district that macadamised roads were first introduced; some of the earliest docks (1803) were made there under the direction of Mr. W. Jessop; and on the Somersetshire Canal was tried Mr. Weldon's extraordinary hydrostatic lock.

To geologists there is the interesting fact that within twelve miles on the Somersetshire Coal Canal, the "father of English geology" made his discovery of the sequence of strata; and geographers will recollect that Sebastian Cabot sailed from Bristol.